



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: LABARGE ET AL.)
 Serial No.: 09/805,682)
 Filed: March 13, 2001)
 For: ALKALINE EARTH / RARE EARTH)
 LEAN NO_x CATALYST)

Before the Board
of Appeals

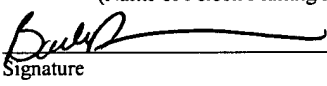
Appeal No:

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APPEAL BRIEF

#17
3/31/03
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I. REAL PARTY IN INTEREST

The real party in interest in this appeal is Delphi Technologies.

II. RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to Appellant, Appellant's legal representatives, or Assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF THE CLAIMS

Claims 1, 4-16, 19, 20, 24-29 and 31 are pending in the present application.

Claims 1, 4-14, 16, 19, 20, 24 and 31 have been rejected, while Claims 15 and 25-29 have been allowed.

IV. STATUS OF AMENDMENTS

A request for reconsideration was filed on January 6, 2003 and was entered. A copy of the Claims is presented in Appendix A.

V. SUMMARY OF THE PRESENT APPLICATION

The present application relates to a catalyst for purifying gases. The control of NO_x emissions from vehicles is a worldwide environmental problem. Lean-burn, high air-to-fuel ratio, and diesel engines are certain to become more important in meeting the mandated fuel economy requirements of next-generation vehicles, thereby enhancing the need for an effective and durable catalyst for controlling NO_x emissions under net oxidizing conditions. Various alternatives for controlling NO_x emissions have been investigated, such as the use of catalysts that selectively reduce NO_x in the presence of a co-reductant, e.g., selective catalytic reduction (SCR) using ammonia or urea as a co-reductant. Unfortunately, just solving the problem of catalyst activity in an oxygen-rich environment is not enough for practical applications. Like most heterogeneous catalytic processes, the SCR process is susceptible to chemical and/or thermal deactivation. Many

lean-NO_x catalysts are too susceptible to high temperatures, water vapor and sulfur poisoning (from SO_x).

A leading catalytic technology for removal of NO_x from lean-burn engine exhausts involves NO_x storage reduction catalysis, commonly called the "lean-NO_x trap". The lean-NO_x trap technology can involve the catalytic oxidation of NO to NO₂ by catalytic metal components effective for such oxidation, such as precious metals. The lean-NO_x-trap technology, however, has been limited to use for low sulfur fuels because catalysts that are active for converting NO to NO₂ are also active in converting SO₂ to SO₃. Lean NO_x trap catalysts have shown serious deactivation in the presence of SO_x because, under oxygen-rich conditions, SO_x adsorbs more strongly on NO₂ adsorption sites than NO₂, and the adsorbed SO_x does not desorb altogether even under fuel-rich conditions.

To address the problems associated with NO_x reduction in exhaust gases, a catalyst for treating an exhaust gas stream was developed, disclosed, and claimed. This catalyst is a NO_x occluding catalyst structure comprising an alkaline earth exchanged zeolite and having an outer layer comprising at least about 50 weight percent of an alkaline earth component, and not more than about 42 weight percent of a rare earth component. Also disclosed and claimed is a catalyst for treating an exhaust gas stream comprising: a NO_x occluding catalyst structure comprising an alkaline earth exchanged zeolite and an alkaline earth alumina having an outer layer comprising at least about 50 wt% of an alkaline earth oxide component, not more than about 42 wt% of a rare earth oxide component, a surface area stabilizer, and a ceramic oxide binder.

VI. ISSUES

1. WHETHER U.S. PATENT NO. 5,051,392 TO MABILON ET AL. ANTICIPATES CLAIMS 1, 5-14, 16, AND 31 UNDER 35 U.S.C. §102(b).
2. WHETHER U.S. PATENT NO. 4,988,660 TO CAMPBELL, IN VIEW OF U.S. PATENT NO. 5,053,372 TO BROWNSCOMBE OR IN VIEW OF U.S. PATENT NO. 4,929,338 TO WORMSBECHER, RENDERS CLAIMS 1, 4, 16, 19, 20, 24, AND 31, OBVIOUS.
3. WHETHER U.S. PATENT NO. 5,545,604 TO DEMMEL RENDERS CLAIM 24 OBVIOUS.

VII. GROUPING OF THE CLAIMS

Claims 1, 4-14 and 31 are directed to catalyst for treating an exhaust gas stream comprising a NO_x occluding catalyst structure comprising an alkaline earth exchanged zeolite and having an outer layer comprising at least about 50 weight percent of an alkaline earth component, and not more than about 42 weight percent of a rare earth component.

Claim 15 is directed to a catalyst for treating an exhaust gas stream comprising a NO_x occluding catalyst structure having an outer layer comprising an alkaline earth component, a rare earth component, and a binder wherein the binder is selected from the group consisting of acidic aluminum oxide sol, alkaline aluminum oxide sol, ammonium aluminum oxide sol, and mixtures thereof, and is present in an amount of at least about 2 wt% and less than about 6 wt%.

Claims 16 and 19 are directed to a catalyst for treating an exhaust gas stream comprising a NO_x occluding catalyst structure comprising an alkaline earth exchanged zeolite and an alkaline earth alumina having an outer layer comprising at least about 50 wt% of an alkaline earth oxide component, not more than about 42 wt% of a rare earth oxide component, a surface area stabilizer, and a ceramic oxide binder.

Claim 20 is directed to a catalyst for treating an exhaust gas stream comprising a NO_x occluding catalyst structure having an outer layer comprising at least about 70 wt% calcium oxide component, not more than about 25 wt % neodymium oxide component,

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not more than about 3 wt% zirconium surface area stabilizer, and at least about 2 wt% ammonium aluminum oxide sol binder.

Claim 24 is directed to a catalyst for treating an exhaust gas stream comprising a NO_x occluding catalyst structure comprising an alkaline earth exchanged zeolite and an alkaline earth alumina and having an outer layer comprising an alkaline earth oxide component, a rare earth oxide component, a surface area stabilizer, and a ceramic oxide binder.

Claims 25-29 are directed to a method for making a catalyst, comprising combining a calcium compound and a neodymium compound with a support to form a calcium-neodymium catalyst; combining the calcium-neodymium catalyst with a binder; washcoating a substrate with the calcium-neodymium catalyst; and calcining the washcoated substrate.

VIII. ARGUMENT

1. Claims 1, 5 – 14, 16, and 31 Are Patentable Under 35 U.S.C. §102(b) Over Mabilon et al.

Mabilon et al. teach a catalyst having a porous layer, wherein the porous layer comprises at least one refractory inorganic oxide; about 0.1 to about 25% of at least one uranium oxide; about 0.1 to about 35% of at least one oxide of at least one metal selected from the group consisting of lithium, sodium, potassium, rubidium, cesium, beryllium, magnesium, calcium, strontium, barium, lanthanum, praseodymium, neodymium, gadolinium, yttrium, and zirconium; and a catalytically active phase (Abstract). The zeolite of Mabilon is a substrate onto which the porous layer is deposited (Column 3, lines 26-30). Appellants' Claims 1 and 16, however, claim in part a NO_x occluding catalyst comprising an outer layer having at least about 50 wt% of an alkaline earth component, and not more than about 42 wt% of a rare earth component.

As stated in prior responses, the rejection is based upon the position that "at least about 50 wt%" includes a range of "0.1 to about 35 wt%". In response to the Appellants' previous arguments, the Examiner has continued to assert that it is not considered unreasonable for one skilled in the art to interpret the claimed range of "at least about 50%" as incorporating at least some of the values encompassed by the prior art range of

"0.1 to about 35%" (Paper 13, Pages 8-9). The Examiner has maintained this interpretation in the Advisory Action of January 10, 2003 (Paper 15, Page 2). Appellants have disagreed on the basis that the subject of the present claims and the cited art is catalysts. It is well recognized that the art of catalysis is highly unpredictable, and that even small changes in composition can have unexpected effects. "The unpredictability of catalytic phenomena has been recognized... [A] successfully catalyzed process depends not only on the particular catalyst that may be employed but also on the environment within which the catalysis is accomplished..." *In re Mercier*, 515 F.2d 1161, 185 U.S.P.Q. 774, 779-80 (C.C.P.A. 1975).

Because of the inherent unpredictability associated with catalysts, one of ordinary skill in the catalytic art know that relative terms such as "about" are not reasonably accorded a scope that would result in overlap of the values encompassed by "0.1 to about 35%" and "at least about 50%". This is particularly so where the reference discloses a range that ends at 35% - it is clear that in disclosing a range of "0.1 to about 35%", the reference considers that the 35% is a maximum, and that the values should be less than that maximum. The present claims, on the other hand, are directed to a minimum of about 50%. One of ordinary skill in the art would not, and would have no reason to, stretch the minimum of about 50% so far as to encompass values of 35% or even lower.

The Examiner has stated no basis for the assertion that "[I]t is not considered unreasonable" for one skilled in the art to consider the subject ranges to be overlapping. Applicants continue to be of the opinion, that it would in fact be unreasonable, particularly based on the nature of the catalytic art. Essentially, to go from the 35% of Mabilon et al. to the 50% of the present claims, an artisan would need to expand the Mabilon et al. range by greater than 40%; an unreasonable amount.

The Examiner further notes that "the prior art ingredients are the same..." (Paper 13, Page 10). The Examiner's basis for this argument is that "because the zeolite of Mabilon is impregnated, at least some of the alkaline earth [metal] would be exchanged" (Paper 15, Page 2). The Examiner also states "applicant does not appear to offer any argument or evidence to the contrary" (Paper 15, Page 2). Applicants disagree. As discussed previously, it is noted that the catalyst claimed in the present application comprises a difference in ingredients that is even recognized by one of the references of

record. Claim 1 is directed to an alkaline earth exchanged zeolite. Mere deposition, as performed in Mabilon et al., is not the same as ion exchange. Wormsbecher, in fact, specifically states that “In order to obtain the maximum degree of metals tolerance while avoiding undue deactivation of a zeolite component..., the zeolite containing catalyst is added in a form that *does not ion exchange with the zeolite component.*” (Column 4, lines 55-64, emphasis added) The forms of the alkaline earth metal added to the zeolite are oxides, hydroxides, carbonates, or sulfates (Column 4, lines 49-50). Thus, in reading Wormsbecher as a whole, merely adding an alkaline earth oxide to a zeolite is does not necessarily form an alkaline earth exchanged zeolite. Based upon the teachings of the prior art, the alkaline earth oxide of Mabilon et al. is thus not expected to exchange with the zeolite. Therefore, one of skill in the art would not recognize the zeolite of Mabilon et al. as an alkaline earth exchanged zeolite as required by the present claims, and the Examiner has failed to provide evidence to the contrary.

In other words, some of the ingredients of Mabilon et al. and the present application may be the same, but the amounts and the resulting products are different. It is not reasonable to assume that one of ordinary skill in the art would read 0.1 to about 35% to be expanded by 40% or more to include at least about 50%, and there is no teaching in Mabilon et al. regarding an alkaline earth exchanged zeolite as presently claimed.

To anticipate a claim under 35 U.S.C. §102, a single source must contain all of the elements of the claim. *Lewmar Marine Inc. v. Barient, Inc.*, 827 F.2d 744, 747, 3 U.S.P.Q.2d 1766, 1768 (Fed. Cir. 1987), *cert. denied*, 484 U.S. 1007 (1988). Since Mabilon et al. fail to teach the claimed ranges of the alkaline earth component and fail to teach an alkaline earth exchanged zeolite as is taught an claimed in the present application, Mabilon et al. fail to anticipate or to render obvious the present invention.

For at least these reasons, Appellants request reversal of the Examiner’s rejections and allowance of the claims.

2. Claims 1, 4, 16, 19, 20, 24, and 31 Are Non-obvious Over Campbell in View of Brownscombe or Wormsbecher.

Campbell discloses alkali metal doped double perovskites useful in the oxidative coupling of alkanes to higher hydrocarbons (Abstract). Perovskites are very specific compounds such as, for example, LnAMnTO_6 , wherein Ln is lanthanum, cerium, neodymium, samarium, praseodymium, gadolinium, and dysprosium, A is one or more alkaline earth metals, and T is one or more of iron, cobalt and nickel (Column 3, lines 42-51).

Claim 1 of the present application claims a NO_x occluding catalyst structure comprising an alkaline earth exchanged zeolite, and Claim 16 claims a NO_x occluding catalyst structure comprising an alkaline earth exchanged zeolite and an alkaline earth alumina. Campbell does not teach or suggest a “structure comprising an alkaline earth exchanged zeolite” or a “structure comprising an alkaline earth exchanged zeolite and an alkaline earth alumina” as required by the present claims. Campbell also fails to teach or suggest such a structure having an “outer layer comprising at least about 50 wt% of an alkaline earth oxide component, not more than about 42 wt% of a rare earth oxide component” as required by the present claims.

Claim 1 has been rejected as it is alleged that Campbell discloses catalysts comprising neodymium (Column 3, line 45) and calcium (Column 7, lines 52-60). Claims 4 and 19 are rejected as Campbell allegedly discloses up to about 60% calcium oxide. (Column 7, lines 52-60), neodymium (Column 3, line 45), zirconia (Column 7, lines 66-67), and alumina (Column 8, lines 14-18).

The Examiner relies upon Campbell to disclose catalyst comprising neodymium and calcium and the ranges of these metals. The Examiner admits that Campbell fails to disclose an alkaline earth exchanged zeolite. Appellants disagree with the Examiner's view of the ranges of the components and the position regarding perovskites. Regarding the use of perovskites as NO_x occluding catalysts, Appellants contend that perovskites are structurally different than the presently claimed NO_x occluding catalyst structure and contend that the Examiner has failed to shown any evidence that perovskites can be used or that one of ordinary skill in the art would have an expectation of success when employing a perovskite as a NO_x occluding catalyst. Regarding the ranges, Appellants

assert that “at least about 70 wt%” is different from and does not include about 0.1 to 60 wt%, and that an artisan would not interpret, even given the broadest interpretation, at least about 70 wt% as including about 0.1 to 60 wt%. Giving a broad interpretation does not equate to ignoring claim elements.

In addition to the difference in the ranges, as admitted by the Examiner, Campbell fails to disclose an alkaline earth exchanged zeolite (Paper 13, Page 4). While Campbell discloses many types of supports such as alumina, zirconia, titania, and the like (Column 8, lines 14-25), Campbell does not disclose the use of zeolites, let alone alkaline earth exchanged zeolites. Consequently, Brownscombe and Wormsbecher are separately relied upon by the Examiner to allegedly teach an alkaline earth exchanged zeolite.

Brownscombe is directed to “Basic Alkaline Earth Metal-Zeolite Compositions” having specific compositions; namely “any metal cation exchanged into the zeolite is in excess of that required to provide a fully metal cation-exchanged zeolite”. (Abstract).

The Examiner contends that the motivation to combine is “because Brownscombe discloses his alkaline earth exchanged zeolite as a shape selective catalyst... and as supports for catalytic components...” (Paper 13, Page 4) The Examiner suggests adding the zeolite of Brownscombe to the perovskite of Campbell because Brownscombe generally states that “[i]t is an object of the present invention to provide alkaline earth metal-zeolite compositions... useful as supports...” (Column 2, lines 25-30). The Examiner maintains this rejection in the Advisory Action of January 10, 2003 (Paper 15, Page 2). However, a mere statement that a material is intended to be useful as a support does not provide the necessary motivation and expectation of success to make the combination suggested by the Examiner or to thereby render the present application obvious. There is no motivation, particularly in the catalysis arts, that an alkaline earth exchanged zeolite is a proper support for an alkali metal doped double perovskite. Various materials cannot merely be mixed because one is labeled a support. These are different materials that may react or otherwise effect the catalytic activity of the supported material. Campbell does not list zeolites as potential supports useful with the perovskites. There is not teaching or motivation to make this combination.

An Examiner cannot establish obviousness by locating references that describe various aspects of a patent applicant’s invention without also providing evidence of the

motivating force that would have impelled one skilled in the art to do what the patent applicant has done. *Ex parte Levengood*, 28 U.S.P.Q. 1300 (Bd. Pat. App. Int. 1993). The references, when viewed by themselves and not in retrospect, must suggest the invention. *In Re Skoll*, 187 U.S.P.Q. 481 (C.C.P.A. 1975). When viewed by themselves, without the motivation of the present application, there is no motivation to combine Campbell and Brownscombe as suggested by the Examiner. The Examiner's alleged motivation is a disregard for the general art of catalysis as well as the use of improper hindsight gleaned from the present Application, and not a teaching from the references themselves.

In applying Section 103, the U.S. Court of Appeals for the Federal Circuit has consistently held that one must consider both the invention and the prior art "as a whole", not from improper hindsight gained from consideration of the claimed invention. See, *Interconnect Planning Corp. v. Feil*, 227 U.S.P.Q. 543, 551 (Fed. Cir. 1985) and cases cited therein. According to the *Interconnect* court

[n]ot only must the claimed invention as a whole be evaluated, but so also must the references as a whole, so that their teachings are applied in the context of their significance to a technician at the time - a technician without our knowledge of the solution. *Id.*

Campbell does not teach the use of a zeolite support. Campbell cannot provide the motivation to use any type of zeolite as a support. Brownscombe teaches a specific type of zeolite; an alkaline earth zeolite. While Brownscombe teaches that the alkaline earth exchanged zeolite may be used as a support, Brownscombe does not teach or suggest any utility with perovskite catalysts. The Examiner thus must be using improper hindsight in making the rejection.

In order to make the combination suggested by the Examiner, one would have to ignore the teachings of Campbell regarding suitable supports (no motivation, no expectation of success) and select a zeolite support (no motivation, no expectation of success, improper hindsight). One would then, from among all of the possible zeolite supports, have to specifically select an alkaline earth exchanged zeolite (picking and choosing, improper hindsight, no motivation, no expectation of success) and use it with

the catalyst of Campbell. For the foregoing reasons, a prima facie case of obviousness over Campbell and Brownscombe has not been made.

For at least these reasons, Appellants request reversal of the Examiner's rejections of over Campbell and Brownscombe and allowance of the claims.

Wormsbecher is directed to a "Catalyst Cracking Catalyst and Process". Wormsbecher actually teaches away from an alkaline earth exchanged zeolite. "In order to obtain the maximum degree of metals tolerance while avoiding undue deactivation of a zeolite component..., the alkaline earth metal component is added to the zeolite containing catalyst in a form that *does not* ion exchange with the zeolite component" (Column 4, lines 58-63; emphasis added). In other words, Wormsbecher does not want an alkaline earth exchanged zeolite due to zeolite deactivation. What Wormsbecher does teach is a rare earth exchanged zeolite (Column 4, lines 24-31).

In making the rejection, the Examiner states that "it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the alkaline earth exchanged zeolite of Wormsbecher in the catalyst of Campbell because Wormsbecher discloses his alkaline earth exchanged zeolite in a catalytic cracking catalyst and process" (Paper 13, Page 6). The Examiner maintains this line of reasoning in the Advisory Action of January 10, 2003 (Paper 15, Page 2).

As stated above, and as admitted by the Examiner, Campbell does not mention zeolites, let alone alkaline earth exchanged zeolites. Appellants submit that Wormsbecher does not disclose an alkaline earth exchanged zeolite and that the Examiner is mistaken in the interpretation of Wormsbecher. The "ion exchange" cited by the Examiner in the Advisory Action of January 10, 2003 (Paper 15, Page 2) is actually "ion exchange[] to remove soluble impurities such as sodium and sulfates" (Column 5, lines 8-11). In Column 6, lines 33-36 (in the Examples), washing with water, 10% ammonium sulfate and 5% ammonium carbonate to remove sodium ions and sulfates is disclosed. Thus, Appellants believe that the treatment with ammonium sulfate and ammonium carbonate is the ion exchange referred to by the Examiner. The only teaching with respect to ion exchange of an alkaline earth metal component is to **not** ion exchange. As stated earlier, Wormsbecher teaches away from exchange with the alkaline earth component. The Examiner appears to disregard Wormsbecher's teaching not to ion

exchange the alkaline earth metal component, and assumes (without any teaching or support) that the ion exchange to remove sodium and sulfates is an alkaline earth ion exchange. Appellants submit that nowhere in Wormsbecher is an alkaline earth exchanged zeolite taught or suggested. The only exchanged zeolite in Wormsbecher is the rare earth exchanged zeolite.

For an obviousness rejection to be proper, the Examiner must meet the burden of establishing that all elements of the invention are disclosed in the prior art; that the prior art relied upon contains some suggestion or incentive that would have motivated the skilled artisan to modify a reference or combined references; and that the proposed modification of the prior art must have had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988); *In Re Wilson*, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970); *Amgen v. Chugai Pharmaceuticals Co.*, 927 U.S.P.Q.2d, 1016, 1023 (Fed. Cir. 1996).

With respect to the combination of Wormsbecher and Campbell as suggested by the Examiner, Wormsbecher does not teach an alkaline earth exchanged zeolite and further specifically teaches away from such a combination. Because Wormsbecher does not disclose an alkaline earth exchanged zeolite, it cannot provide the motivation or expectation of success for the use of an alkaline earth exchanged zeolite.

When read as a whole, Wormsbecher does not teach an alkaline earth exchanged zeolite and specifically teaches away from forming an alkaline earth exchanged zeolite. Consequently, when reading the references as a whole, an artisan cannot be motivated to combine Campbell with an alkaline earth exchanged zeolite, because Wormsbecher does not have an alkaline earth exchanged zeolite. Additionally, there is no teaching, suggestion, or expectation of success with the combination of the composition of Wormsbecher with the perovskite of Campbell. Based on the teachings in the references, one might use an alkaline earth impregnated zeolite in Campbell, although the references do not even provide an expectation of success for this combination. Consequently, Wormsbecher and Campbell, alone and in combination also fail to render the present application obvious.

For at least these reasons, Appellants request reversal of the Examiner's rejections over Campbell and Wormsbecher and allowance of the claims.

3. Claim 24 is Non-obvious in View of Demmel.

Claim 24 of the present application is directed to a NO_x occluding catalyst structure comprising an alkaline earth exchanged zeolite and an alkaline earth alumina and having an outer layer comprising an alkaline earth oxide component, a rare earth oxide component, a surface area stabilizer, and a ceramic oxide binder.

The Examiner contends that Demmel discloses a catalyst comprising 50-95% calcium oxide in the final product, alumina as a binder, and 40% alumina, wherein alumina also serves as support of the other materials (Paper 10, Page 5). Demmel, however, does not teach a structure comprising "an alkaline earth exchanged zeolite and an alkaline earth alumina", or an outer layer comprising "an alkaline earth oxide component, a rare earth oxide component, a surface area stabilizer, and a ceramic oxide binder" disposed on that structure as required by the present claims.

In making the rejection, the Examiner admits that Demmel does not disclose an alkaline earth exchanged zeolite. The Examiner states that is obvious "to use an alkaline earth exchanged zeolite because Demmel discloses alkaline earth impregnated zeolites for a density better suited for homogeneous fluidization" (Paper 13, Page 7). This line of reasoning is maintained in the Advisory Action of January 10, 2003 (Paper 15, Page 2). At the very least, Demmel does not disclose an alkaline earth exchanged zeolite, thus there is not teaching or suggestion to use such a zeolite. Appellants further submit that there is no motivation to use an alkaline earth exchanged zeolite in the materials of Demmel, nor is there an expectation of success for such a substitution.

For an obviousness rejection to be proper, the Examiner must meet the burden of establishing that all elements of the invention are disclosed in the prior art; that the prior art relied upon, coupled with knowledge generally available in the art at the time of the invention, must contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or combined references; and that the proposed modification of the prior art must have had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was

make. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988); *In Re Wilson*, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970); *Amgen v. Chugai Pharmaceuticals Co.*, 927 U.S.P.Q.2d, 1016, 1023 (Fed. Cir. 1996).

The Examiner contends that because Demmel discloses an alkaline earth impregnated zeolite that the use of an alkaline earth exchanged zeolite would have been obvious. First, there is not teaching to use an alkaline earth exchanged zeolite and therefore at least one element of the present claims is not disclosed in Demmel. Second, Demmel does not provide the motivation to use an alkaline earth exchanged zeolite. When read as a whole, Demmel teaches “gluing together” the bastnaesite particles and alkaline earth metal oxide particles with a binder “so that the resulting composite particles would have a density better suited for homogeneous fluidization with typical zeolite hydrocarbon cracking catalysis” (Column 6, lines 2-9). The “glued” composite particles are thus impregnated in a zeolite. If an alkaline earth exchanged zeolite were used instead of an alkaline earth impregnated zeolite, the alkaline earth component presumably would not be available for “gluing” with the bastnaesite particles and the binder. Such an arrangement would thus be contrary to the teachings of Demmel, which clearly teaches gluing of the alkaline earth oxide to the bastnaesite particles to form composite particles. Thus Demmel does not provide the motivation to use an alkaline earth exchanged zeolite.

Third, based upon the teaching of Wormsbecher against an alkaline earth exchanged zeolite, it clearly would not have been obvious to use an alkaline earth exchanged zeolite as contended by the Examiner. As discussed previously, Wormsbecher clearly teaches the use of an alkaline earth impregnated zeolite and teaches away from the use of an alkaline earth exchanged zeolite. According to the teachings of Wormsbecher, an alkaline earth exchanged zeolite would not be used when an alkaline earth impregnated zeolite is desired.

Forth, Demmel does not provide an expectation of success for the use of an alkaline earth exchanged zeolite. Demmel specifically teaches gluing the alkaline earth oxide to the bastnaesite particles to form composite particles. If one were to use an alkaline earth exchanged zeolite, would one still form the composite particles? There is

no expectation of success for ignoring the teachings of Demmel and not gluing the alkaline earth oxide to the bastnaesite particles to form composite particles.

In order to make the substitution suggested by the Examiner, one would have to ignore the teachings of Demmel regarding the formation of composite particles to form an impregnated zeolite (no motivation, no expectation of success) and use an alkaline earth exchanged zeolite (no motivation, no expectation of success, a different composition than that taught by Demmel), despite the fact that one of the references of record (Wormsbecher) teaches away from using an alkaline earth exchanged zeolite when an alkaline earth impregnated zeolite is desired. Thus, the Examiner has failed to make a prima facie case of obviousness over Demmel.

For at least these reasons, Appellants request reversal of the Examiner's rejection over Demmel and allowance of the claims.

IV. ALLOWED CLAIMS

Claims 15 and 25-29 have been allowed. It is noted that Claim 15 is not limited to an ammonium aluminum oxide sol binder. Claim 15 is patentable because the prior art fails to teach a catalyst for treating an exhaust gas stream comprising a NO_x occluding catalyst structure having an outer layer comprising an alkaline earth component a rare earth component and a binder wherein the binder is selected from the group consisting of acidic aluminum oxide sol, alkaline aluminum oxide sol, ammonium aluminum oxide sol, and mixtures thereof, and is present in an amount of at least about 2 wt%, and less than about 6 wt%.

VII. CONCLUSION:

In view of the foregoing, it is urged that the Final Rejection of Claims 1, 4 – 14, 16, 19, 20, 24, and 31 be reconsidered and withdrawn. The final rejection is in error and should be reversed.

DP-302561

If there are any additional charges with respect to this Response, please charge them to Deposit Account No. 06-1130.

Respectfully submitted,
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Appendix A

1. (Previously Twice Amended) A catalyst for treating an exhaust gas stream comprising:

a NO_x occluding catalyst structure comprising an alkaline earth exchanged zeolite and having an outer layer comprising at least about 50 weight percent of an alkaline earth component, and not more than about 42 weight percent of a rare earth component.
- 2,3 (Cancelled)
4. (Previously Amended) The catalyst of Claim 1 wherein the outer layer comprises an alkaline earth component in an amount of at least about 70 weight percent and a rare earth component in an amount of not more than about 25 weight percent.
5. (Original) The catalyst of Claim 1 wherein the alkaline earth component is selected from the group consisting of calcium, strontium, barium, and mixtures thereof.
6. (Original) The catalyst of Claim 5 wherein the alkaline earth component is calcium.
7. (Original) The catalyst of Claim 1 wherein the rare earth component is selected from the group consisting of lanthanum, cerium, neodymium, and mixtures thereof.
8. (Original) The catalyst of Claim 7 wherein the rare earth component is neodymium.
9. (Original) The catalyst of Claim 1 wherein the outer layer comprises a surface area stabilizer selected from the group consisting of oxides of silicon, titanium, zirconium, and mixtures thereof.
10. (Original) The catalyst of Claim 9 wherein the surface area stabilizer comprises zirconium.

11. (Original) The catalyst of Claim 9 wherein the outer layer comprises a surface area stabilizer in an amount not more than about 7 wt%.

12. (Original) The catalyst of Claim 11 wherein the outer layer comprises a surface area stabilizer in an amount not more than about 3 wt%.

13. (Original) The catalyst of Claim 1 wherein the outer layer comprises a binder selected from the group consisting of acidic aluminum oxide sol, alkaline aluminum oxide sol, ammonium aluminum oxide sol, and mixtures thereof.

14. (Original) The catalyst of Claim 13 wherein the outer layer comprises an ammonium aluminum oxide sol binder.

15. (Allowed) A catalyst for treating an exhaust gas stream comprising a NO_x occluding catalyst structure having an outer layer, comprising:

an alkaline earth component;

a rare earth component; and

a binder wherein the binder is selected from the group consisting of acidic aluminum oxide sol, alkaline aluminum oxide sol, ammonium aluminum oxide sol, and mixtures thereof, and is present in an amount of at least about 2 wt% and less than about 6 wt%.

16. (Previously Amended) A catalyst for treating an exhaust gas stream comprising:

a NO_x occluding catalyst structure comprising an alkaline earth exchanged zeolite and an alkaline earth alumina having an outer layer comprising at least about 50 wt% of an alkaline earth oxide component, not more than about 42 wt% of a rare earth oxide component, a surface area stabilizer, and a ceramic oxide binder.

17, 18 (Cancelled)

19. (Original) The catalyst of Claim 16 for treating an exhaust gas stream comprising:

a NO_x occluding catalyst structure having an outer layer comprising about 70 wt% alkaline earth oxide component, about 25 wt % rare earth oxide component, about 3 wt% surface area stabilizer, and about 2 wt% ceramic oxide binder.

20. (Original) A catalyst for treating an exhaust gas stream comprising:

a NO_x occluding catalyst structure having an outer layer comprising at least about 70 wt% calcium oxide component, not more than about 25 wt % neodymium oxide component, not more than about 3 wt% zirconium surface area stabilizer, and at least about 2 wt% ammonium aluminum oxide sol binder.

21, 22, 23 (Previously Added and then Cancelled)

24. (Previously Added and Previously Amended) A catalyst for treating an exhaust gas stream comprising:

a NO_x occluding catalyst structure comprising an alkaline earth exchanged zeolite and an alkaline earth alumina and having an outer layer comprising an alkaline earth oxide component, a rare earth oxide component, a surface area stabilizer, and a ceramic oxide binder.

25. (Allowed) A method for making a catalyst, comprising:

combining a calcium compound and a neodymium compound with a support to form a calcium-neodymium catalyst;

combining the calcium-neodymium catalyst with a binder;

washcoating a substrate with the calcium-neodymium catalyst; and

calcining the washcoated substrate.

26. (Allowed) The method of Claim 25, wherein the calcium compound is selected from the group consisting of calcium succinate, calcium tartrate, calcium citrate, calcium acetate, calcium carbonate, calcium hydroxide, calcium oxylate, calcium oleate, calcium palmitate and calcium oxide.

27. (Allowed) The method of Claim 26, wherein the neodymium compound is selected from the group consisting of neodymium acetate, neodymium citrate, neodymium oxylate, neodymium salicylate, neodymium carbonate, neodymium hydroxide and neodymium oxide.

28. (Allowed) The method of Claim 27, wherein the substrate is selected from the group consisting of an alkaline earth exchanged zeolite, an alkaline earth alumina, and mixtures thereof.

29. (Allowed) The method of Claim 28, wherein the binder is selected from the group consisting of acidic aluminum oxide sol, alkaline aluminum oxide sol, and ammonium aluminum oxide sol, and mixtures thereof.

30. (Cancelled)

31. (Previously Added and Previously Amended) The catalyst of Claim 1, wherein said stabilizer is selected from the group consisting of oxides of silicon, titanium, zirconium, and mixtures thereof.